CLAIMS

1. A method for conducting an MR fluid flow study, said method comprising:

applying a first amplitude modulated magnetic field gradient to a predetermined volume of said fluid flowing into a region of interest;

applying a first amplitude modulated RF irradiation to the predetermined volume;

acquiring first data for at least a portion of the region of interest;

applying a second RF irradiation to the predetermined volume of said fluid;

acquiring second data for the at least a portion of the region of interest; and

generating compensated fluid flow data for the at least a portion of the region of interest, wherein the fluid flow data is a function of at least the first data and the second data.

2. The method of claim 1, wherein the second RF irradiation is amplitude modulated.

3. The method of claim 2, wherein an envelope for the amplitude modulation of the first RF irradiation is an absolute value of an envelope for the amplitude modulation of the second RF irradiation.

4. The method of claim 2, wherein an average amplitude for the first RF irradiation is not zero.

5. The method of claim 4, wherein the average amplitude for the first RF irradiation is above zero.

6. The method of claim 5, wherein the average amplitude for the first RF irradiation is below zero.

7. The method of claim 2, wherein an average amplitude for the second RF irradiation is zero.

8. The method of claim 2, further comprising applying a second amplitude modulated magnetic field gradient to the predetermined volume of said fluid.

9. The method of claim 8, wherein an envelope for the amplitude modulation of the second RF irradiation is similar to an envelope for the amplitude modulation of the second magnetic field.

10. The method of claim 2, wherein the second RF irradiation is frequency modulated.

11. The method of claim 10, wherein an envelope for frequency modulation of the second RF irradiation is similar to an envelope for amplitude modulation of the second RF irradiation.

12. The method of claim 2, wherein an envelope for amplitude modulation of the second RF irradiation is a modified square wave.

13. The method of claim 1, wherein an average amplitude for the first RF irradiation is not zero.

14. The method of claim 13, wherein the average amplitude for the first RF irradiation is positive.

15. The method of claim 13, wherein an envelope for the first RF irradiation is an absolute value of a modified square wave.

16. The method of claim 1, further comprising applying a second amplitude modulated magnetic field gradient to at least a predetermined volume of said fluid flowing into a region of interest.

17. The method of claim 16, wherein an envelope for amplitude modulation of the first RF irradiation is similar to an envelope for amplitude modulation of the first magnetic field gradient.

18. The method of claim 16, wherein an envelope for amplitude modulation of the second RF irradiation is similar to an envelope for amplitude modulation of the second magnetic field gradient.

19. The method of claim 16, wherein an envelope for amplitude modulation of the first magnetic field gradient is an absolute function of an envelope for amplitude modulation of the second magnetic field gradient.

20. The method of claim 19, wherein the envelope for amplitude modulation of the second magnetic field gradient is a modified square wave.

21. The method of claim 1, further comprising generating a fluid flow image, wherein generating the fluid flow image comprises subtracting the first fluid flow data from the second fluid flow data.

22. The method of claim 21, wherein generating the fluid flow image further comprises subtracting a representation of a systematic error from the fluid flow image.

23. The method of claim 1, wherein a second RF irradiation has a frequency offset.

24. The method of claim 23, wherein the frequency offset is small compared to frequency of the second RF irradiation.

25. A method for compensating for at least the magnetization transfer effects, comprising the following steps:

applying an amplitude modulated magnetic field gradient;

applying an amplitude modulated control RF irradiation, wherein an envelope for the amplitude modulation of the control RF irradiation is similar to an envelope for the amplitude modulation of the magnetic field gradient;

applying an amplitude modulated labeling RF irradiation.

26. The method of claim 25, wherein the compensating for at least the magnetization transfer effects is performed in a context of MR study.

27. The method of claim 26, wherein the compensating for at least the magnetization transfer effects is performed in the context of an MR imaging study.

28. The method of claim 26, wherein an envelope for the amplitude modulation of the labeling RF irradiation is an absolute value of an envelope for the amplitude modulation of the control RF irradiation.

29. The method of claim 26, wherein an average amplitude for the label RF irradiation is nonzero.

30. The method of claim 29, wherein the average amplitude for the label RF is positive.

31. The method of claim 26, wherein an average amplitude for the control RF irradiation is zero.

32. The method of claim 26, wherein the envelope for the amplitude modulation of the control RF irradiation is a modified square wave.

33. The method of claim 25, wherein the labeling RF irradiation is frequency modulated.

34. The method of claim 33, wherein the labeling RF irradiation is frequency modulated according to an envelope that is similar to an envelope for the amplitude modulation for labeling RF.

35. The method of claim 25, wherein the control RF irradiation is frequency modulated.

36. The method of claim 35, wherein the control RF irradiation is frequency modulated according to an envelope that is similar to an envelope for the amplitude modulation for labeling RF.

37. An MR apparatus constructed and arranged to perform fluid flow imaging, said scanner comprising:

a module for generating amplitude modulated labeling RF irradiation; and

a module for generating an amplitude modulated magnetic field gradient wherein the amplitude modulation of the magnetic field gradient is similar to amplitude modulation of the labeling RF irradiation.

38. The MR apparatus of claim 37, wherein the module for generating the amplitude modulated labeling RF irradiation is further adapted to generate amplitude modulated control RF irradiation.

39. The MR apparatus of claim 38, wherein an envelope of the amplitude modulated labeling RF irradiation is an absolute value of an envelope of the amplitude modulated control RF irradiation.

40. The MR apparatus of claim 38, wherein the envelope of the amplitude modulated control RF irradiation is a modified square wave.

41. The MR apparatus of claim 38, wherein an average amplitude for the labeling RF irradiation is not zero.

42. The MR apparatus of claim 41, wherein the average amplitude for the labeling RF irradiation is positive.

43. The MR apparatus of claim 38, wherein an average amplitude for control RF irradiation is zero.

44. The MR apparatus of claim 37, further adapted to generate a frequency modulated labeling RF irradiation.

45. The MR apparatus of claim 44, wherein an envelope for frequency modulation of the labeling RF irradiation is similar to an envelope for amplitude modulation of the labeling RF irradiation.

46. The MR apparatus of claim 38, further adapted to generate a frequency modulated control RF irradiation.

47. The MR apparatus of claim 46, wherein an envelope for frequency modulation of the control RF irradiation is similar to an envelope for amplitude modulation of the control RF irradiation.

48. A computer readable medium encoding instructions that, when executed, direct a method for generating an image of fluid flow obtained from an MR system, said method comprising:

generating a label image from an MR data obtained by spin labeling flowing fluid using an amplitude modulated labeling RF irradiation and amplitude-modulated magnetic field gradient;

generating a control image from an MR data obtained by simulating at least magnetization transfer effects using amplitude modulated control RF irradiation and an amplitude modulated magnetic field gradient; and

generating the image of the fluid flow by subtracting the label image from the control image.

49. The computer-readable medium of claim 48, wherein said method further comprises generating the image of the fluid flow by subtracting additional error data from the image of the fluid flow.

50. The computer-readable medium of claim 49, wherein said additional error data is obtained by performing labeling and control procedures in a region posterior to an imaging region.